Congresso de Métodos Numéricos em Engenharia
1-3 julho 2019, Guimarães, Portugal
Universidade do Minho

CREEP MODELLING FOR REFRACTORY MATERIALS USED IN FURNACE LININGS

Thaís Soares[1], Miguel Azenha[1] and Paulo Lourenço[1]

1: Institute for Sustainability and Innovation in Structural Engineering
School of Engineer, University of Minho
e-mail: {d8504,miguel.azenha,pbl}@civil.uminho.pt

Keywords: Creep, mechanical properties, elevated loads, high temperatures, refractories

Abstract. *Refractories materials are used by the steel industry in several applications, such as in the internal linings of furnaces for making iron and steel, in vessels for holding and transporting metal and slag, in furnaces for heating steel before further processing, and in the flues or stacks through which hot gases are inducted. They are, therefore, construction materials required to have resistance to molten slag and operate at high temperatures (260–1850°C) under stress for considerable periods of time. Refractory materials are rather expensive, and any failure in them results in a great loss of production time, equipment, and sometimes the product itself. The chosen material also influences energy consumption and product quality. Hence, the problem of obtaining refractories best suited to each application is of great importance for the industry. Considering that during service refractories are exposed to thermal shock, thermal expansion and external mechanical constraints, creep studies are crucial as a design criterion for the mechanical stability and lifespan of structures subjected to high temperature. Consequently, a considerable work on creep of ceramics exists in the literature. In this work, we propose a review on the state of art about creep mechanisms and creep laws applied to refractories materials: the influence of the material composition on the behaviour, the experimental tests necessary to obtain the law parameters and the numerical computation. Specific attention will be given to the necessary simultaneous consideration of the effects of temperature induced creep, together with load induced creep.*

Acknowledgement. This work is developed within the scope of Marie Skłodowska-Curie Actions Innovative Training Networks in the framework of the project ATHOR - Advanced THermomechanical multiscale mOdelling of Refractory linings.